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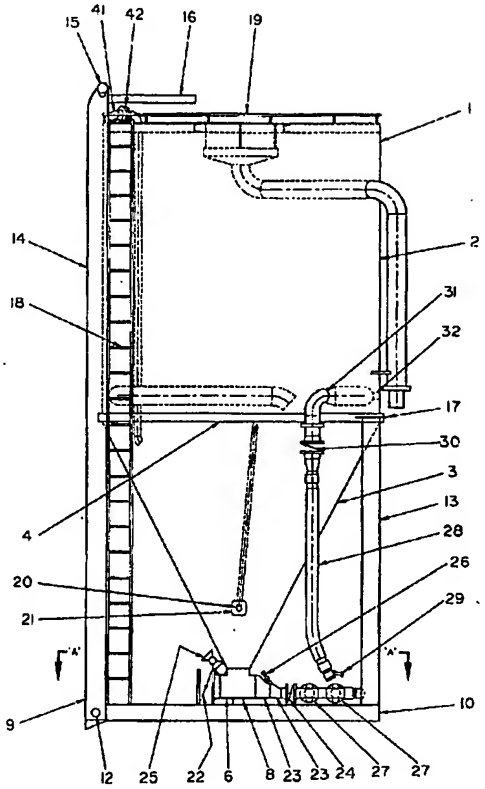
(54) **CUVE DE FLOCULATION CONIQUE**
(54) **CONE SHAPED FLOCCULATION TANK**



(57) When drilling wells a drill fluid is used to lubricate the drill bit and remove the drilled out material from the bottom of the drill hole. In this invention a partly cylindrical and partly conical vertical tank, capable of being moved from site to site, permits the contaminated drill fluid to be cleaned for re-use in the drilling operation, thereby permitting less drill fluid to be used in each drilling operation. The contaminated drill fluid is introduced into the tank at its middle, through an input centrifuge pipe which enlarges and circles the inside of the tank. The centrifuge pipe has slots along its bottom. As the contaminated drill fluid is pumped into the tank the drilled out material settles out and the clear fluid rises to the top of the tank, is retrieved through the output pipe and re-used. The intake of the output pipe is directed upwards and flanged outwards to form a bowl like effect.

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ABSTRACT OF THE DISCLOSURE

When drilling wells a drill fluid is used to lubricate the drill bit and remove the drilled out material from the bottom of the drill hole. In this invention a partly cylindrical and partly conical vertical tank, capable of being moved from site to site, permits the contaminated drill fluid to be cleaned for re-use in the drilling operation, thereby permitting less drill fluid to be used in each drilling operation. The contaminated drill fluid is introduced into the tank at its middle, through an input centrifuge pipe which enlarges and circles the inside of the tank. The centrifuge pipe has slots along its bottom. As the contaminated drill fluid is pumped into the tank the drilled out material settles out and the clear fluid rises to the top of the tank, is retrieved through the output pipe and re-used. The intake of the output pipe is directed upwards and flanged outwards to form a bowl like effect.

DESCRIPTION

This invention relates to a vertical flocculation system used to separate well drilling solids from the drill fluids.

In all manner of well drilling operations, a fluid, usually but not necessarily water, (the "drill fluid") is used as part of the drilling process. The drill fluid is pumped into the hole being drilled (the "drill hole") to the point where the drilling occurs and then ejected. In the process the drill fluid becomes contaminated with solids (the "drill solids").

At present the drill fluid contaminated with the drill solids (the "contaminated drill fluid") is pumped into holding tanks or holding pit sunk into the ground. The drill solids settle out while the fluid is held in such a tank or pit. The drill fluid, if water, is then spread out and dries. If the drill fluid is other than water, the drill fluid is otherwise disposed of. In either event at present the drill fluid is not re-used after having been once pumped into and ejected from the drill hole. In excess of 1,000 cubic metres of drill fluid may be used in one drill operation.

The present technology, therefore, does not make effective use of the drill fluid and is not environmentally friendly.

Prior art as described by Zingg in Canadian Patent No. 1166970 in well drilling operations is directed towards concentrating a slurry at the bottom of a tank having a cylindrical upper part and a conical lower part with the output pipe means at the lower end of the conical part and a bore in the upper part with the bore axis of generation the same as the axis of the cylindrical upper part and conical lower part. While this design as described by Zingg is effective in creating a concentrated slurry at the bottom of the conical tank, it is not effective in separating the solids from the fluid such that when the liquid is removed by the output pipe, the fulid is effectively without solid contaminants.

The concept of a flocculation system to separate solids from liquids is well known and used in the mining industry. The system used in the mining industry does not need to be moved from location to location. In a well drilling operation each well is at a different site and each drill operation usually takes less than 3 weeks. The flocculation systems used in the mining industry are not moved and involve much greater amounts of fluid and contaminant. The flocculation system for a well drilling operation must be capable of being conveniently moved by truck from one

location to another. The mining systems, therefore, cannot work effectively to separate drill solids from the drill fluids in a well drilling operation.

Borrowing the general concept from the mining industry, I have found that a flocculation system, consisting of a tank, the top of portion of which is cylindrical and the bottom portion of which is conical, such that the outer edge of the conical portion attaches to the cylindrical top portion, and specially designed and located input and output pipes for the drill fluid, can effectively separate the drill solids from the drill fluid, thereby permitting the drill fluid to be re-used in the drilling process. The top portion of the tank is approximately equal in length to the bottom portion. The input pipe, through which the contaminated drill fluid is pumped into the tank is located in the middle portion of the tank, and after entering into the tank enlarges and continues inside the tank tangentially with the wall. The input pipe is slotted on the bottom to permit the drill fluid and drill solids to exit from the input pipe into the tank. Slotting the input pipe on the bottom is more effective than merely permitting the drill fluid to enter the tank through the open end of the input pipe. The open end of the input pipe may be 3/4 closed to prevent plugging. At the bottom of the tank, being the tip on the conical portion, is located a valve mechanism to permit the removal from time to time of drill solids which have settled out, as well as to empty the tank at the completion of drilling process.

The output pipe, from which the drill fluid can be reused in the drill process is located towards the top of the cylindrical portion of the tank. The output pipe has its opening directly towards the top of the tank and is flanged outwardly to create a bowl. As the entire tank fills with fluid the fluid eventually reaches the level of this bowl type opening, spills over it's edge and into the output pipe, thereby lessening the possibility of any contaminant being in the drill fluid to be reused.

In drawings which illustrate embodiments of the invention,

Figure 1, is a perspective view of one embodiment;

Figure 2, is an elevation view of the embodiment;

Figure 3, is an elevation view of this embodiment at rights angles to Figure 2;

Figure 4, is an elevation view of this embodiment at right angles to Figure 2 and directly opposite to Figure 3;

Figure 5, is a top plan view of this embodiment partly in section;

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Figure 6, is a detail of the input centrifuge pipe inside the tank;

Figure 7, is a section of the line of A-A of Figures 2, 3, and 4.

The tank 1 is made of steel of appropriate diameter with openings as hereinafter further mentioned, the upper portion 2 of which is cylindrical and the lower portion 3 of which is conical such that the apex of the cone is directed downwards and at the juncture of the cylindrical portion 2 and conical portion 3 is reinforced by a steel reinforcing rim 4. In this embodiment the height of the upper portion 2 and the lower portion 3 are equal. The tank has a flat circular steel top 5. The bottom of the conical portion 3 of the tank is truncated and rests on and opens into a T-shaped chamber 6. The T-shaped chamber 6 is attached to a steel beam 7 by means of a steel support bracket 8.

The entire tank 1 and T-shaped chamber 6 rest on and are supported by a J-shaped skid 9 which supports the tank when standing upright and which permits the tank to be rested horizontally for transporting. The skid 9 may be made of steel and in the embodiment illustrated consists of three parallel beams each of appropriate length, the middle of one of which is beam 7 under the support bracket 8 and the outer of which are beams 10.

At one end of the three beams 7 and 10 is another steel beam 11 of appropriate length which is welded to the beams 7 and 10 such that one steel beam 10 is at each end of beam 11 and beam 7 is in the middle of beam 11. At the other end of the beams 7 and 10 is welded a tube 12 of any convenient diameter approximately the thickness of the beams 7 and 10. Tube 12 assists in loading and unloading the tank for transportation. Welded upwards to beams 10 and at right angles to beams 10 and 11 are two beams 13 which are of such a length that they extend to the height of the reinforcing rim 4.

At the end of beams 10 opposite to beams 13 and at right angles to beams 10 and pipe 12 are two beams 14 slightly longer in length than the entire tank assembly welded upwards from beams 10 and pipe 12. At the top of beams 14 is welded a pipe 15 in between them which assists in moving the tank assembly onto and off trucks for transport. Welded to beams 14, just immediately below pipe 15 and in the same direction as beams 10 are two pipes 16 which are help to insure the tank does not get damaged when being transported.

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The tank assembly is secured in the skid by means of steel gussets 17. In the embodiment there are six gussets 17, two of which are welded to the beams 13 and rim 4, and two of which are welded to beams 14 and rim 4 and two of which are welded to the top of the upper portion 2 of the tank and the beams 14. Along one beam 14 is welded a metal ladder 18 to permit access to the top 5 of the tank. Around the circumference of the top 5 is welded is a small metal safety rail 19.

In the lower portion 3 of the tank a metal steam line 20 of any convenient diameter may be inserted in any convenient location through the tank. The steam line 20 is secured to the lower portion 3 of the tank by a metal plate 21. There is no aperture or opening from the steam line into the interior of the tank 1 but its purpose is solely to permit steam to the piped through it in winter to prevent any fluid in the tank 1 from freezing.

The T-shaped chamber 6 is attached to a gear driven butterfly valve 22 at one end and through reducers 23 to a smaller butterfly valve 24 at the other end. Valve 22 is used solely for cleaning purposes. The T-shaped chamber 6 has a blowout line and valve 25 attached to it to assist in cleaning. To the reducers 23 another injection line and valve 26 may be located to further assist in cleaning the tank. The butterfly valve 24 is attached to any number of butterfly valves 27 to dispose of the sediment from the tank.

The contaminated drill fluid is pumped into the tank assembly by means of an input hose 28. The input hose may have an injection line 29 which is used to inject fluids containing polymers or other chemical additives into the contaminated drill fluid to aid in the flocculation process. Prior to the input hose connecting to the tank assembly it can be fitted with a check valve 30 to insure that if for some reason the fluid pressure in the input hose 28 drops, the fluid pressure from the tank assembly will not force back fluid down hose 28. The input hose 28 is attached to the tank assembly by means of the steel circular input centrifuge pipe 31 which in the embodiment shown is located slightly above the supporting rim 4. The centrifuge pipe 31 leads from the exterior of the upper portion 2 of the tank into the interior. In the interior of the tank 2 the centrifuge pipe 31 enlarges to reduce the velocity of the contaminated drill fluid. In the embodiment shown the diameter of the centrifuge pipe 31 is one-third again as large once inside the tank 2. The centrifuge pipe 31 is curved in a diameter slightly smaller than the inside diameter of the tank 2 and at its end is curved slightly downwards. It is attached to the

interior of tank 2 by means of steel spacers 32 conveniently located around the circumference. Along the bottom of the centrifuge pipe 31 there are openings 33 to permit the contaminated drill fluid to enter tank 1. In the embodiment shown there are 18 equally spaced and sized openings 33 each being rectangular in shape and of any convenient size. The end of the centrifuge pipe 31 may be 3/4 closed off to stop any extremely large drill solids from entering tank 1.

The top of the tank 5 may have small steel beams 34 welded to its underside to act as roof stiffeners.

In the embodiment shown an access grating 35 and manway 36 are also provided on the top 5 to permit physical access to the interior of the tank 1.

Attached by means of metal suspension rods 37 to the inside of the top 5 is a circular bowl 38 in the bottom of which is located the output pipe 39. The bowl 38 is supported from the roof 5 so that its rim is horizontal. The drill fluid is then able to flow into output pipe 39 by flowing over the rim of the bowl 38. At the outside of the tank 1 the output pipe 39 may be attached to tank 1 by means of a gusset 40.

The tank assembly may also be fitted with a load line 41 which may be used either to introduce other fluids into the tank 1 to be processed with the contaminated drill fluid or to introduce further fluid to enhance the processing of the contaminated drill fluid. The load line 41 may have a check valve 42 to ensure that no fluid from the tank 1 backs down the load line 41.

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CLAIMS

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. A tank for use as a vertical flocculation system to actively separate solids from fluids comprising of a tank means being a cylindrical upper portion means and a conical lower portion means; an open-ended input pipe means which may be slotted at the bottom opening into the tank means tangentially with the wall of the tank means within the bottom half of the upper tank means and the upper half of the conical lower portion means and continuing inside the tank means tagentially with the wall of the tank means through which the fluid containing the solids can be introduced into the tank means; an output pipe means at the upper end of the tank means through which the fluid can be retrieved out of the tank means; and a manifold mechanism at the bottom of the conical lower portion means through which the separated solid can be removed.

2. A tank according to Claim 1 wherein the height of the cylindrical upper portion means is approximately equal the height of the cylindrical lower portion means.

3. A tank according to Claim 1 wherein the input pipe means is immediately above the joint of the cylindrical upper portion means and the conical lower portion means.

4. A tank according to Claim 2 wherein the input pipe means is immediately above the joint of the cylindrical upper portion means and the conical lower portion means.

5. A tank according to Claim 1 wherein the input pipe means enlarges within the interior of the tank means.

6. A tank according to Claim 2 wherein the input pipe means enlarges within the interior of the tank means.

7. A tank according to Claim 1 wherein the input pipe means has aperture means on the bottom to permit solids to settle out through the input pipe means.

8. A tank according to Claim 2 wherein the input pipe means has aperture means on the bottom to permit solids to settle out through the input pipe means.

9. A tank according to Claim 7 wherein the aperture means are rectangular slots.

10. A tank according to Claim 8 wherein the aperture means are rectangular slots.

11. A tank according to Claim 1 wherein the pipe means is deflected slightly downward at its open end.

12. A tank according to Claim 2 wherein the pipe means is deflected slightly downward at its open end.

13. A tank according to Claim 1 wherein the intake of the output pipe means opens directly upwards.

14. A tank according to Claim 2 wherein the intake of the output pipe means opens directly upwards.

15. A tank according to Claim 13 wherein the intake of the output pipe means flanges outward.

16. A tank according to Claim 14 wherein the intake of the output pipe means flanges outward.

17. A tank according to Claim 13 wherein the intake of the output pipe means is attached to a bowl means opening directly upwards.

18. A tank according to Claim 14 wherein the intake of the output pipe means is attached to a bowl means opening directly upwards.

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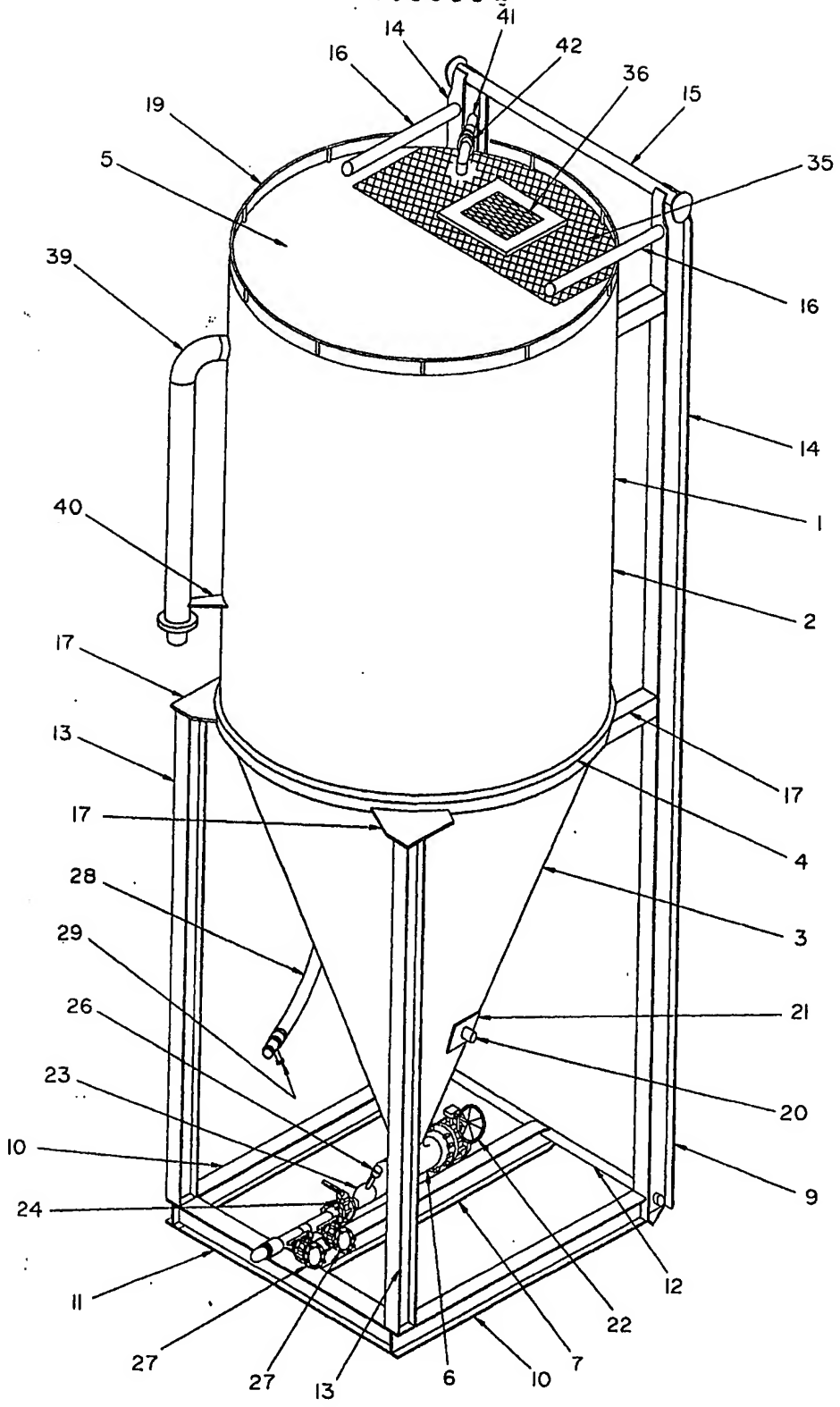
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FIGURE 1

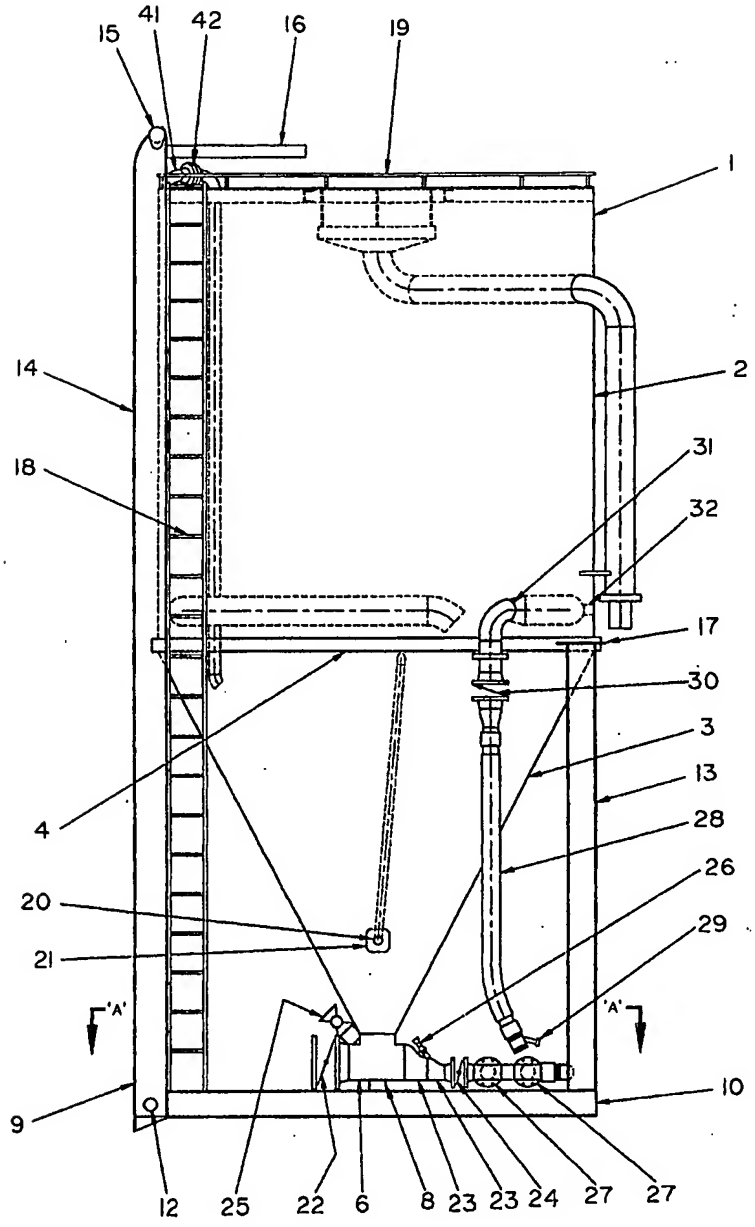
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FIGURE 2

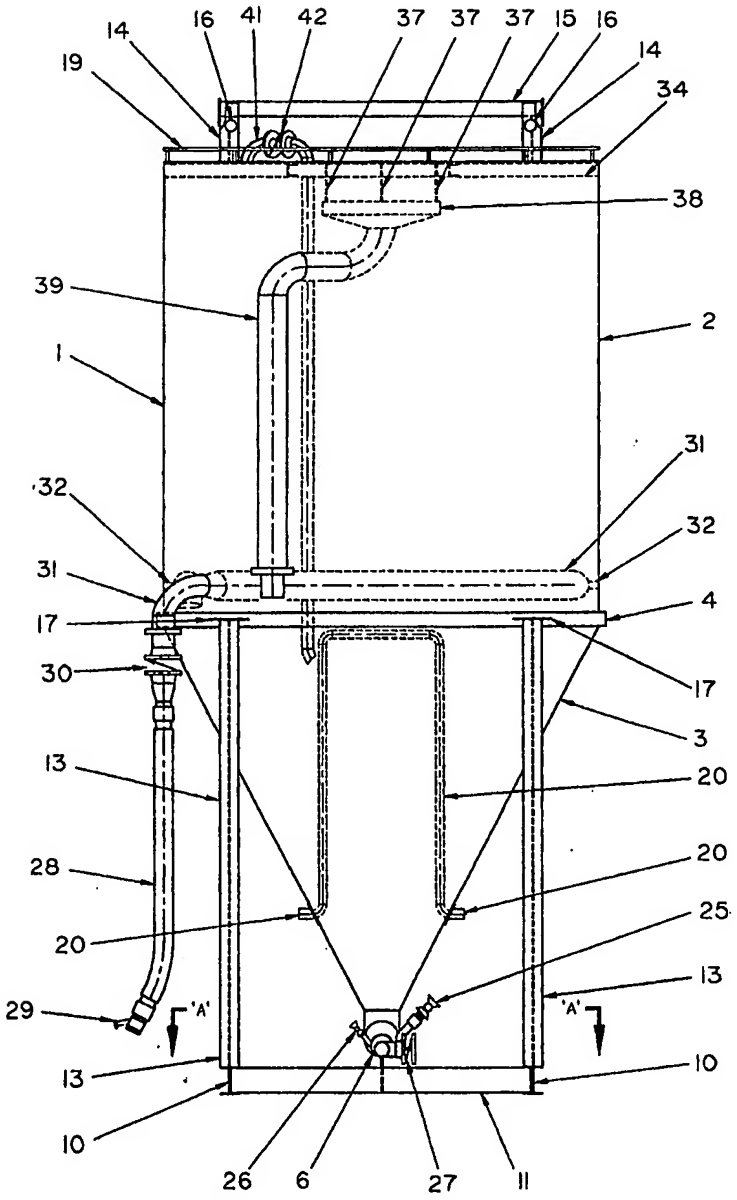
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FIGURE 3

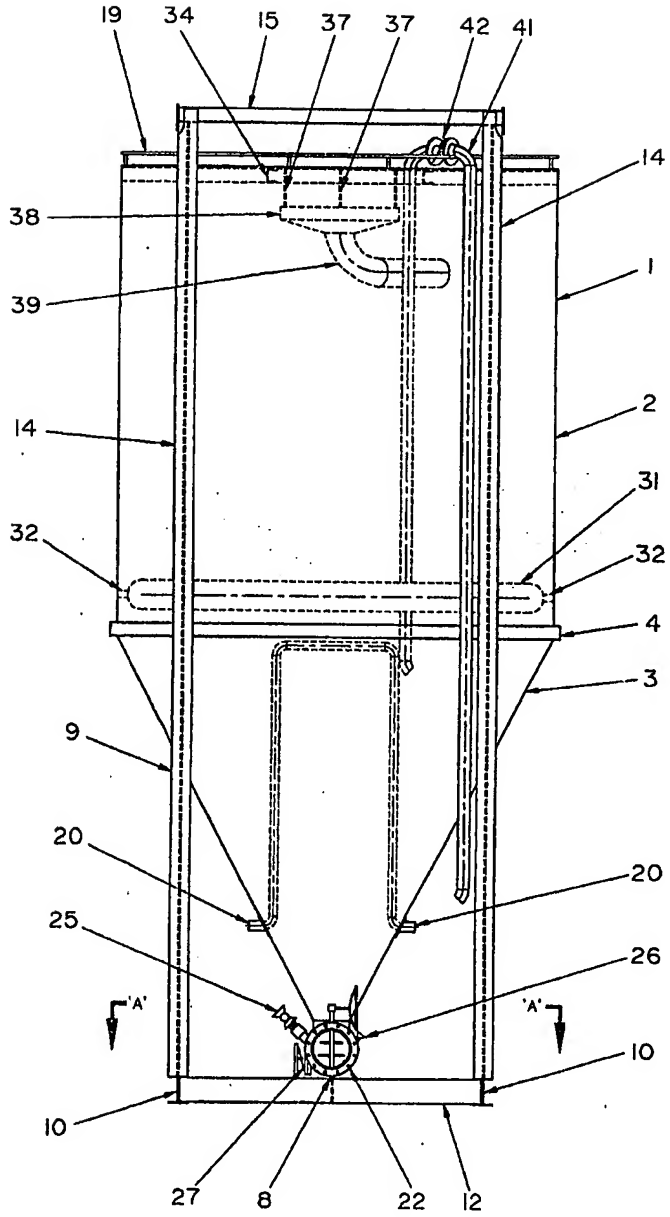
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FIGURE 4

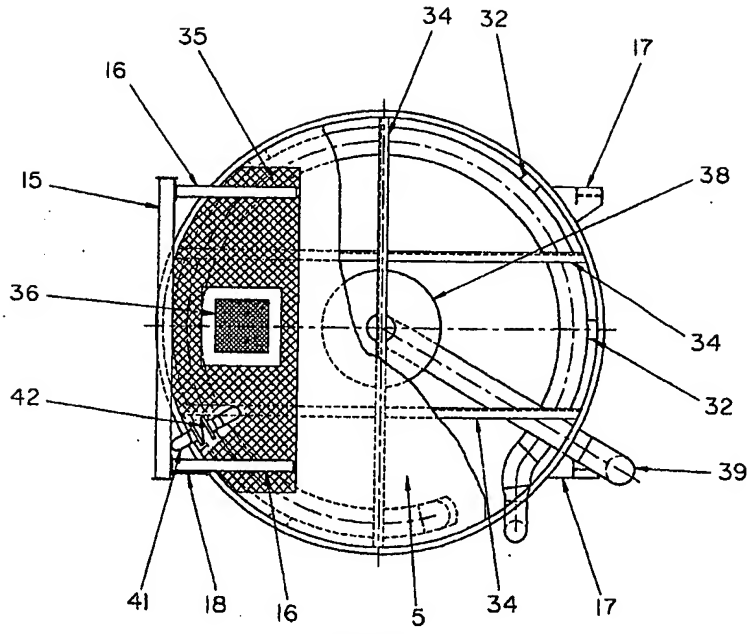


FIGURE 5

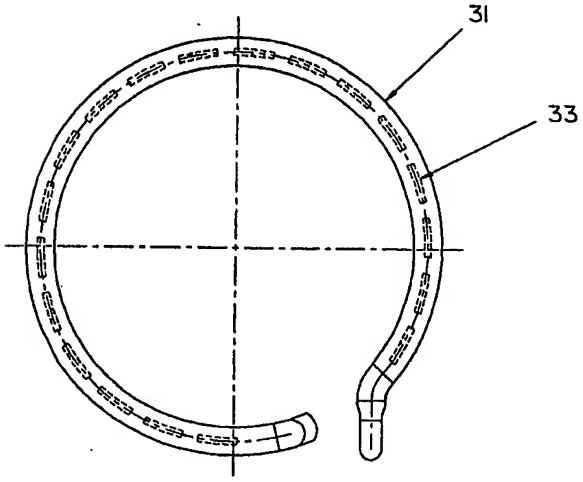
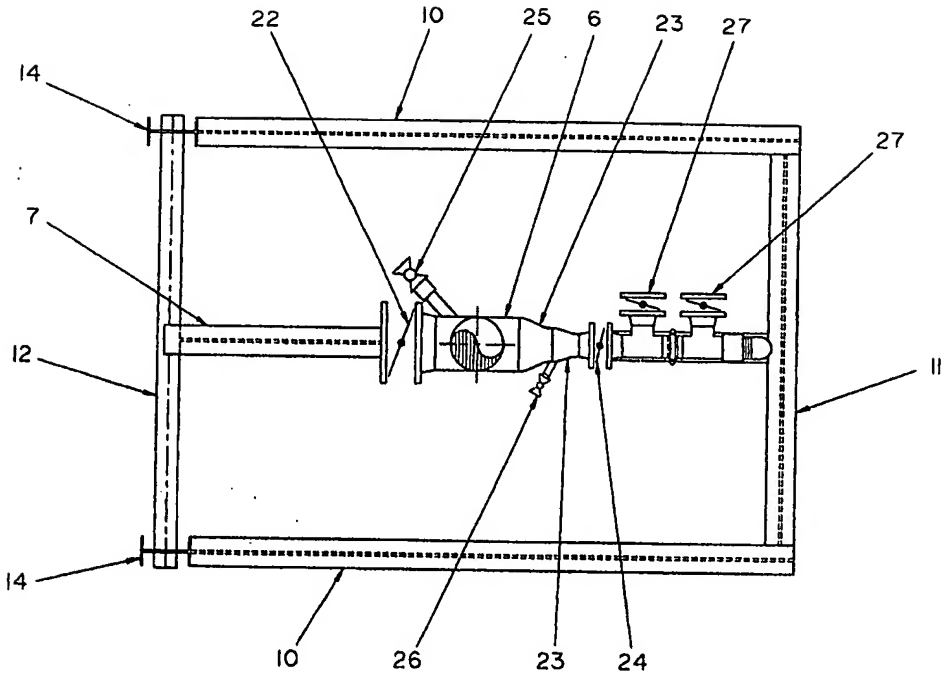


FIGURE 6



SECTION 'A-A'

FIGURE 7